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PATENT SPECIFICATION

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(54) GAS BURNERS

(71) We, C. A. SUNDBERG AKTIEBOLAG, a Joint Stock Company organised under the laws of Sweden, of Bonasvagen 1, 170 20 Kallhall, Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a burner for burning gaseous fuels with an admixture of air. Such burners are widely used *inter alia* within the metallurgical industry for various heating purposes. These burners have hitherto usually comprised a burner head in which a sheet of asbestos is held in place in a holder with the aid of metal netting on one or both of its surfaces. An inlet is provided for a gaseous fuel, and the fuel is allowed to flow through the asbestos sheet, after which it is ignited. The structure of the asbestos sheet is such as to provide channels through which the fuel can flow. A drawback of this arrangement is that the channels in the sheet are not permanent, but are destroyed by erosion and therefore the asbestos sheet has only a short life. Moreover the flames go into the asbestos and destroy the metal netting, so that the asbestos can fall out.

It has been proposed to use in place of asbestos sheet a sheet made of metal in which small holes have been drilled. This is expensive, and it is moreover not advisable to have straight holes, as there is then a risk that the flames will strike back.

According to the invention there is provided a burner for gaseous fuels, comprising inlet means for fuel and air connected to a chamber with a porous wall through which fuel/air mixture may pass for burning adjacent its downstream surface in use of the burner, wherein the porous wall is made of sintered metal in layers so that the wall has a pore diameter that decreases in the direction of flow of gas from about 100 microns at the upstream surface of the wall to about 20 microns at the downstream surface of the wall.

The wall member can have any desired shaped. It can be flat, dome-shaped, spherical or cylindrical. When the wall member is cylindrical, the fuel can come from the inside, flowing out, or it can come from the outside, flowing in. The last-mentioned flow situation is appropriate when, for instance, it is required to heat a shaft.

The present invention will be described in more detail with reference to the accompanying drawings, in which:—

Figure 1 shows a burner head with a known type of wall member arranged in a holder;

Figure 2 shows a burner head according to the present invention, the holder being of the same kind as the one shown in Figure 1;

Figure 3 shows the wall and holder according to Figure 2 partly cut away in perspective and partly sectioned;

Figure 4 shows a burner head with a cylindrical wall, according to the present invention; and

Figure 5 shows a section in detail of a wall member according to the invention.

Figure 1 shows a holder 1 of inverted frusto-conical shape having at its apex a cylindrical part 2 screwed onto a pipe connection 3 at the bottom of which there are two inlets 4 and 5. At the upper opening of the holder is mounted a circular sheet of asbestos 6, which is secured between two metal nets 7 and 8. Air is fed through the inlet 4, and a gaseous fuel through the inlet 5. The air and the fuel are mixed in the pipe connection 3, and the mixture passes through the asbestos sheet 6. As previously mentioned, the disadvantages of this arrangement are that the asbestos is destroyed through erosion and can fall apart, and that it is possible for the flames to strike back.

In the burner according to the invention, the unit composed of the parts 6, 7 and 8 is replaced by a porous metal wall 9 as shown in Figure 2, which is of sintered construction, having layers of which the innermost has a pore diameter of about 100 microns and the outermost has a pore dia-

meter of about 20 microns. The pores occurring in the metal in the course of manufacture from natural channels for the flow of fuel, which are not straight.

The metal wall can be made of any suitable metal whatsoever. Metals which can be used for this purpose are stainless steel and bronze. To produce the porous metal, it is appropriate to use small metal spheres which are sintered together. Alternatively some or all of the metal particles can be threads. When a wall member is produced, it is made so as to consist of two or more layers, the metal particles in the various layers having different grain sizes. The layer of metal particles with the largest grain size is nearest the surface of the wall member that constitutes the inlet surface, and thereafter the different layers of decreasing grain sizes are positioned towards the outer surface of the wall member. Instead of using integral layers in this way, it is also possible to use a series of sintered metal sheets having corresponding properties. These sheets can then be stacked one upon the other, or they can also be joined together in a known metallurgical way. In a composite wall member a thin layer may consist entirely of metal threads.

Figure 5 shows a wall member consisting of two layers, *viz.* an inner layer 10 of sintered metal particles of large grain size, and a layer 11 of sintered metal particles of small grain size. The layer 10 is appropriately chosen so that the channels have a cross sectional width of about 100 microns and the layer 11 is appropriately chosen so that the channels have a cross sectional width of about 20 microns.

It should be obvious that the grain sizes of the metal particles of any intermediate layers can be chosen so that channels of any desired cross sectional width can be provided between the above limits. The wall member as a whole or any of its various layers, can also be given thicknesses to suit any special requirements determined by the purpose for which a particular wall member is to be used.

Figure 3 shows a porous metal wall member 9 of similar construction to that of Figure 2 secured to two ring members 12 and 13. At the upper end of the frustoconical holder 1, a mixture of fuel and air flows through the wall member 9. Since the mixture flows through channels which are not straight, the flames from the ignited mixture cannot strike back through the wall member 9. A great number of small, intensive flames with a length of approximately 10 mm. are obtained adjacent the member 9. This has the consequence that objects to be heated can be placed close to the heater, and it is not necessary to use indirect heat radiated from *e.g.* the walls of a furnace. When the flame in the burner according to Figure 3 is extinguished, it is possible to lay one's hand on the surface of the wall member immediately, because of the great cooling effect achieved by the cool gas flowing through the small channels.

Figure 4 shows a tubular porous metal wall member 14 of similar cross-sectional configuration to that of Figure 2. The wall member 14 is arranged co-axially inside a holder comprising an outer non-porous wall member 15, which at its lower ends has two flange surfaces 16 and 17, directed inwards, so that an annular interior space 18 is formed. An inlet 19 is connected to the member 15. Fuel with an admixture of air is fed to the space 18 through the pipe 19. This fuel flows into the central space 20 via the wall member 14. The fuel that flows out through the inner envelope surface of the wall member 14 can be ignited to form a layer of burning mixture and cylindrical objects can be heated within the burner head described.

The burner head described with reference to Figure 4 can be modified to have the fuel/air mixture fed to an interior cylindrical objects can be heated within the through a porous metal outer cylindrical wall.

In the foregoing it has also been stated that the wall member can have a spherical and dome-shaped form. It will be understood that, generally speaking, the wall member can have any form whatsoever, and can thus be adapted to a form which gives a direction of the flames which is appropriate for heating of any particular desired object.

WHAT WE CLAIM IS:—

1. A burner for gaseous fuels, comprising inlet means for fuel and air connected to a chamber with a porous wall through which fuel/air mixture may pass for burning adjacent its downstream surface in use of the burner, wherein the porous wall is made of sintered metal in layers so that the wall has a pore diameter that decreases in the direction of flow of gas from about 100 microns at the upstream surface of the wall to about 20 microns at the downstream surface of the wall.

2. A burner as claimed in claim 1, wherein the particles that are sintered to form the porous wall are spherical.

3. A burner as claimed in claim 1, wherein at least some of the metal that is sintered to form the porous wall is in the form of threads.

4. A burner as claimed in any preceding claim, wherein the sintered metal is stainless steel or bronze.

5. A burner as claimed in any preceding

claim, wherein the porous wall is cylindrical.

6. A burner as claimed in any of claims 1 to 4, wherein the porous wall is a flat disc.

7. A burner for gaseous fuel, substantially as hereinbefore described, with reference to Figures 2 to 5 of the accompanying drawings.

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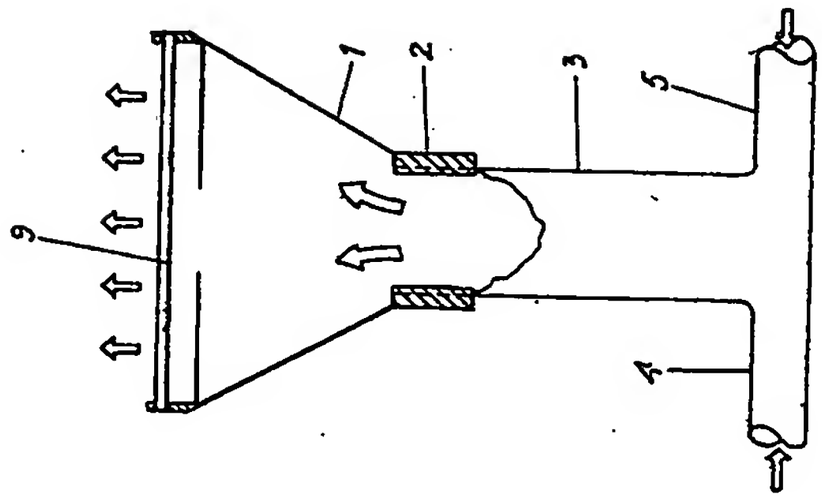

Fig. 2.

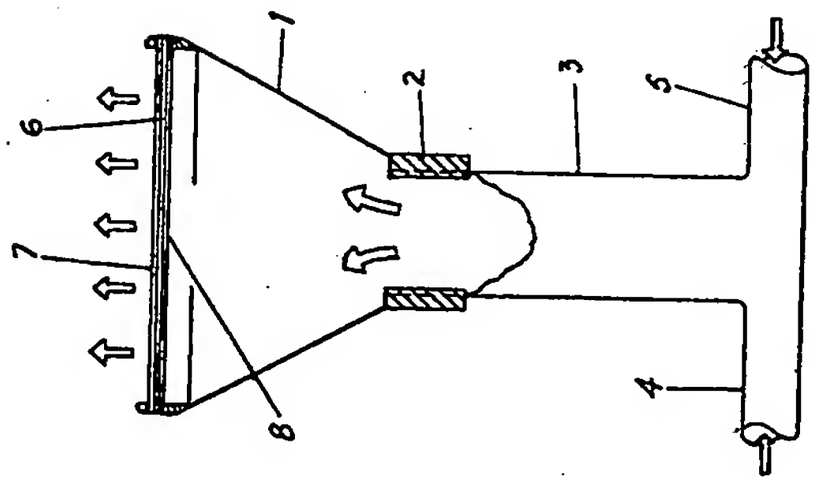

Fig. 1.

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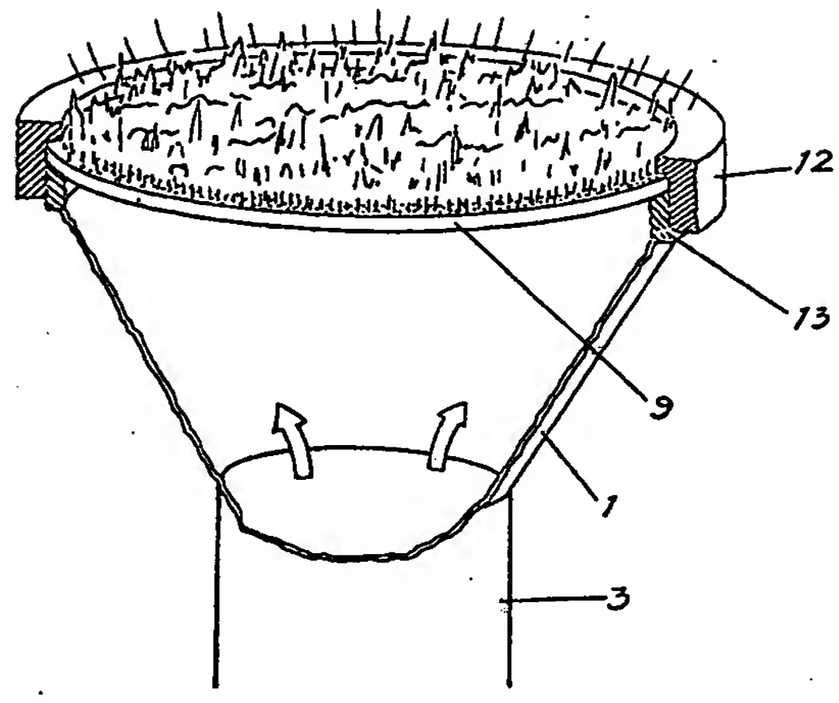
Sheet 2

Fig. 3.



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Sheet 3

Fig. 4

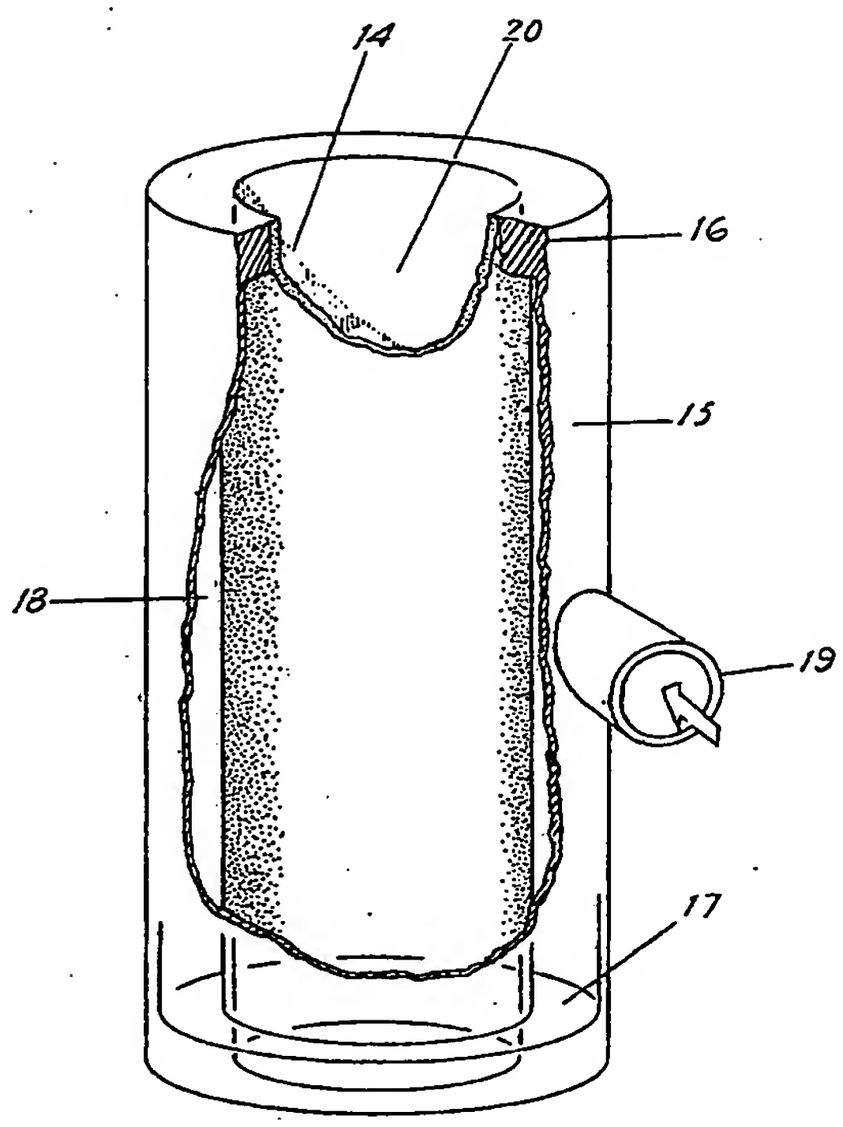

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Fig. 5.